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PLANCTONOLOGICAL SURVEY OF THE NORTH-AEGEAN SEA

by

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SUMMARY

A planctonological survey in the North-Aegean sea was carried out in three different seasons during the years 1963-1964.

Twenty standard seasonal stations were established and the collected plancton was studied qualitatively and quantitatively. Special emphasis is given to the meso-zoo-plancton.

Indications are given concerning the geographic distribution, seasonal occurrence and variation of many planctonic organisms.

A list of the recorded species is also included.

The study will continue next year.

SIGNIFICANCE OF INVESTIGATED AREA

Systematic studies on the zooplankton of the Aegean Sea are scarce. Sporadic investigations were carried out by the Danish oceanographic vessel THOR in 1908-1910 and, more recently, by the U.S.S. VEMA of Lamont Geological Observatory, by the French oceanographic vessel CALYPSO, the Russian one ACADEMICIAN VAVILOV etc.

The East-Mediterranean bassin, is less well studied than the West one, and especially the North-Aegean Sea (designated in this report as N.A.S.) which from the planctonological point is almost unknown. However, that particular area has many interesting features. On the one hand it is a transitional area, between the colder and less saline waters of Black Sea and the Sea of Marmara and the warmer and more saline East-Mediterranean bassin.

On the other hand there is a continuous inflow of fresh water from the larger rivers of northern Greece which have their mouths in the N.A.S.

The N.A.S. includes also the most extended continental shelf of Greece and, consequently one of the richest fishery areas of the country.

The geological formation of the Aegean-Sea is rather recent; numerous islands, submarine trenches and a complicated system of currents are adding interest to this region.

According to PERES & PICARD (1964) the benthic biological communities in the N.A.S., north of the 38° parallel are of boreal character differing markedly from the subtropical benthos of southern regions. For the above reason appeared worthwhile to study the composition geographic distribution and seasonal variation of the zooplankton, in connection with the physico-chemical factors of the sea.

FASILITIES AND TECHNIQUE

The present study was carried out with the assistance of the Hydrographic Service of the Royal Hellenic Navy. Plancton samples and oceanographic data were secured during the seasonal cruises of H.M.S. ARADNE

Collection of plancton'samples were effected at twenty standard stations, widely distributed over the entire N.A.S., during the autumn (October) 1963, the spring (April) 1964 and the summer (August) 1964.

Two types of plancton nets were used:

- a) Nylon net N°10 (109 meshes per linear inch). Opening 50cm. Length 165cm. Towing for 15'. Speed 3 knots.
- b) Monel net N°8 (50 meshes per linear inch) Gulf V, high speed plancton sampler. Opening 44cm. Length 140cm. Towing for 20' . Speed 7 knots.

The collected plancton was fixed immediately in 5% formalin.

Quantitative evaluation of the plancton's volume was done after fixation.

The determinations of the planctontes was done in the Zoological Laboratory by Mrs Moraïtou-Apostolopoulou biologist and by the author, and a list of all the species encountered in each station was established. The proportion of the adult individuals of each species (sometimes also the larval forms) was calculated as follows:

The total volume of the sample-plancton plus the supernatant liquid-was mesured,

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By thorough mixing the planctontes were uniformly suspended. For this mixture a known fraction was taken and all the individual forms it contained were determined and counted in a specially designed dish. The number of each species thus obtained was multiplied in order to get the total number of individuals contained in the sample.

Bigger forms as Siphonophora, Euphausiacea, etc were counted from the whole sample.

Together with the plancton the following oceanographic data were recorded: meteorological conditions (atmospheric pressure, wind, rainfall, cloudness, temperature of the air) color and transparency of the water, temperature, oxygen, salinity and currents in different depths.

RESULTS

I. Qualitative composition

The included list of species gives a picture of the mesoplancton at the surface in the N.A.S. This list is, by no means, exhaustive. Data from winter cruises and from deep water layers are still lacking. Fish eggs and larvae were left undetermined. From the phytoplankton only the Dinoflagellata (Ceratum) are included.

The list calls for the following remarks:

I. Dinoflagellata. From the eight species of Ceratum listed, C. massiliense seems the commonest.

It occurs in large numbers in almost each station at summer and autumn being rare only at spring. C. contrarium, C. carriense, C. hexacanthum, C. karsteni are also common species lacking from the surface only at spring. Concerning this group there is no significant difference between day and night.

2. Protozoa.

Globigerina bulloides (Foraminifera) and colonies of Sphaerococcus punctatum (Radiolaria) are by far the commonest forms. Acantharia occurred at several stations but only during the summer.

3. Cnidozoa, Ctenophora, Tunicata.

Those rather bigger forms are variously and unequally represented in the plancton samples.

A ctenophore Hormiphora plumosa is recorded from one station. Among the Scyphozoa Cotylorhiza tuberculata was observed in very large swarms, in autumn. Salpae (Thalia democratica) occur also in swarms in spring and autumn. Bassia bassensis and to a lesser extent Eudoxoides spiralis are the commonest siphonophora. Hydroid medusae are infrequent.

4. Crustacea

This group unequivocally outnumbers all other animals in each sample.

This imbalance seems more pronounced in the zooplankton of the N.A.S. than in that of other regions at the Mediterranean.

a) Cladocera

They are constantly abundant. From the four species as yet recorded, Evadne spinifera is, by far, the more important both in number of individuals and in range of distribution. This species occurs indifferently at the surface over shallow and deep waters. On the contrary Penilia avirostris, is restricted to the NW corner of the N.A.S. & with one exception, inside the isobath of 100m. (see figure). P. avirostris is considered in West-Mediterranean as an indicator of Atlantic waters. Common in brackish waters occurs also in the Black Sea and near the Suez canal (DELLA CROCE).

P. avirostris was abundant only in autumn samples.

b) Ostracoda

Conchoecia obtusata are relatively frequent.

c) Copepoda

More than 30 species were recorded. The relative abundance and seasonal variations of the dominant Copepods

The circles are proportional to the total number of Copepods encountered in each station. The center of the circle locates the station considered. The sectors indicate the numeric contribution of the dominant species to the sample.

The poorest samples were not included in those figures. Temora stylifera is, by far, the commonest Copepod in this area. However its frequency depends on the season (GAMULIN). It reaches a maximum in summer (sometimes more than 80% of the total copepodic population) decreases slightly in autumn and almost disappears in spring.

Clausocalanus furcatus takes the place of Temora as the more numerous Copepod in autumn; it is replaced by Centropages typicus in spring. Calanids are always present and numerous. There is a variety of Coryceids, among them Corycella rostrata is the most common.

Two species, Candacia aethiopica and Centropages violaceus generally considered of Atlantic origin are concomitant in the west half of the investigated area.

C.violaceus has a wider distribution than C.aethiopica, but, as a whole, the two species are present or absent together (see figure).

d) Other Crustacea

Several Amphipods, especially Hyperia schizogeneios and H.latissima, an Isopod, Eurydice truncata and the planctonic Decapod Leucifer typus are not infrequent. Among the Mysidacea Anchialina agilis and Gastrosaccus lobatus are the commonest in night samples, but always represented by few individuals.

5. Mollusca

A pteropod Creseis acicula predominates in summer and autumn. Atlanta, Pterotrachea e.a. are less common.

6. Chaetognaths

The number of species recorded is astonishingly small for this very important group. Sagitta enflata, Sagitta minima, eventually S. serratodentata are the only representatives. They occur frequently but in moderate numbers.

7. Eggs and Larvae

Fish eggs are present in several samples. Huge numbers of Engraulis encrassicholus' eggs were encountered in autumn.

Larvae, especially of Decapods are conspicuous. No attempt was made to identify all these forms.

Other meroplanktonic forms, Molluscs, Annelida, Bryozoa, etc are also present.

II. Quantitative Composition

Although counting of the organisms in each sample was carefully done, the use of two different types of nets does not allow a comparison of the numerical data without correction. But an appreciation, as indicated in the included list of stations is already possible.

In general the density of the zooplankton increases from spring to autumn, with intermediate values in summer. As usual, the plankton was more abundant at night. The water contains more plankton near the mouths of the important rivers (Pinios, Axios, Strymon, Nestos, Evros) than in the open sea.

CONCLUSIONS

With this preliminary survey a list of meso-zooplanktonic organisms occurring at the surface of the N.A.S. is established for the first time.

In spite of the fact that the stations were numerous and the whole area investigated at three different seasons, the data are still insufficient.

An extension of this study for another year with cruises in winter and collection of plancton from deeper water layers seems necessary.

However the results, thus far obtained are encouraging and some hypotheses concerning the factors responsible for the distribution of the plancton could be actually formulated.

ACKNOWLEDGMENTS

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Thanks are due also to the Lieutenant T.PANTAZIS, the officers and the crew of H.H.M.S. "ARIADNE" for their wonderful spirit of cooperation.

STATIONS

N°	Position		Time/Plancton October 1963	Time/Plancton April 1965	Time/Plancton August 1965
I	40°05N	22°40E	D very abundant	—	D dense
II	40°10N	23°05E	D dense	—	D abundant
III	39°40N	23°00E	N abundant	N scarce	D rather dense
IV	39°50N	23°10E	D dense	D scarce	D rather dense
V	39°20N	23°30E	N dense	N abundant	N rare
VI	40°40N	23°50E	N dense	N abundant	N scarce
VII	38°55N	24°00E	D rather dense	D scarce	D dense
VIII	39°40N	24°20E	D rare	D dense	N scarce
IX	39°10N	24°20E	N scarce	N rather scarce	D scarce
X	38°40N	24°20E	N abundant	D rather scarce	D rare
XI	40°35N	24°35E	N dense	D abundant	D very rare
XII	40°05N	24°35E	—	D scarce	D scarce
XIII	40°25N	24°35E	—	D rare	D scarce
XIV	39°25N	24°40E	D rather dense	—	—
XV	37°55N	24°35E	—	—	D scarce
XVI	40°50N	24°50E	D abundant	D dense	D scarce
XVII	38°40N	25°00E	D scarce	D rather scarce	D rather scarce
XVIII	39°45N	25°30E	—	D rather dense	D rare
XIX	40°20N	25°40E	—	N very abundant	D dense
XX	40°35N	25°40E	—	N scarce	D scarce

D = daytime

N = night

LIST OF PLANKTONIC ORGANISMS RECORDED

° Species recorded from others than the standard stations

DINOFLAGELLATA

Ceratium carriense

C. contrarium

C. fusus °

C. hexacanthum

C. inflatum

C. karsteni

C. macroceros °

C. massiliense

C. pavillardi

FORAMINIFERA

Globigerina bulloides

G. inflata °

Globigerinoides conglobata °

Tretomphalus bulloides

RADIOLARIA

Sphaerozoum punctatum

Spongodiscus mediterraneus

Spongotrochus brevispinus

Stylodictya multispina

Thalassophysa cladococcus

Thalassoxanthium sp.

ACANTHARIA

Several species, non determined

CTENOPHORA

Hormiphora plumosa

SIPHONOPHORA

Bassia bassensis
Eudoxoides spiralis
Hippopodius hippopus

OSTRACODA

Conchoecia obtusata

CLADOCERA

Evadne spinifera
E. nordmanni
Penilia avirostris
Podon intermedius

COPEPODA

Anomalocera pattersoni
Calanus minor
C. gracilis
Calocalanus contractus
Clausocalanus furcatus
Candacia armata
C. aethiopica
C. longimana
Centropages typicus
C. violaceus
Copilia mediterranea
Corycaeus anglicus
C. clausi
C. limbatus
C. speciosus
C. typicus
C. (Pitrichocorycaeus) brehmi
C. (Onychocorycaeus) ovalis
C. (Onychocorycaeus) latus

Corycaeus furcifer
Corycella rostrata
Eucheta sp.
Isias clavipes
Labidocera wollastoni
Oithona plumifera
Oncoea mediterranea
Phaena spinifera
Pleuromamma abdominalis
Pontella mediterranea
Pontellina plumata
Sapphirina opalina
Temora stylifera

AMPHIPODA

Hyperia schizogeneios
H. latissima
H. galba °
Phronima sp.
Vibilia sp.

ISOPODA

Eurydice truncata
Idothea metallica

MYSIDACEA

Anchialina agilis
Gastrosaccus lobatus
Siriella norvegica

EUPHAUSIACEA

Euphausia krohni

DECAPODA

Lucifer typus

SCYFEOZOA

Liriope tetraphylla
Cotylorhiza tuberculata

TUNICATA

Thalia democratica
Oicopleura sp.

MOLLUSCA

Creseis acicula
Limacina bulloides
Atlanta sp.
Pterotrachea sp.

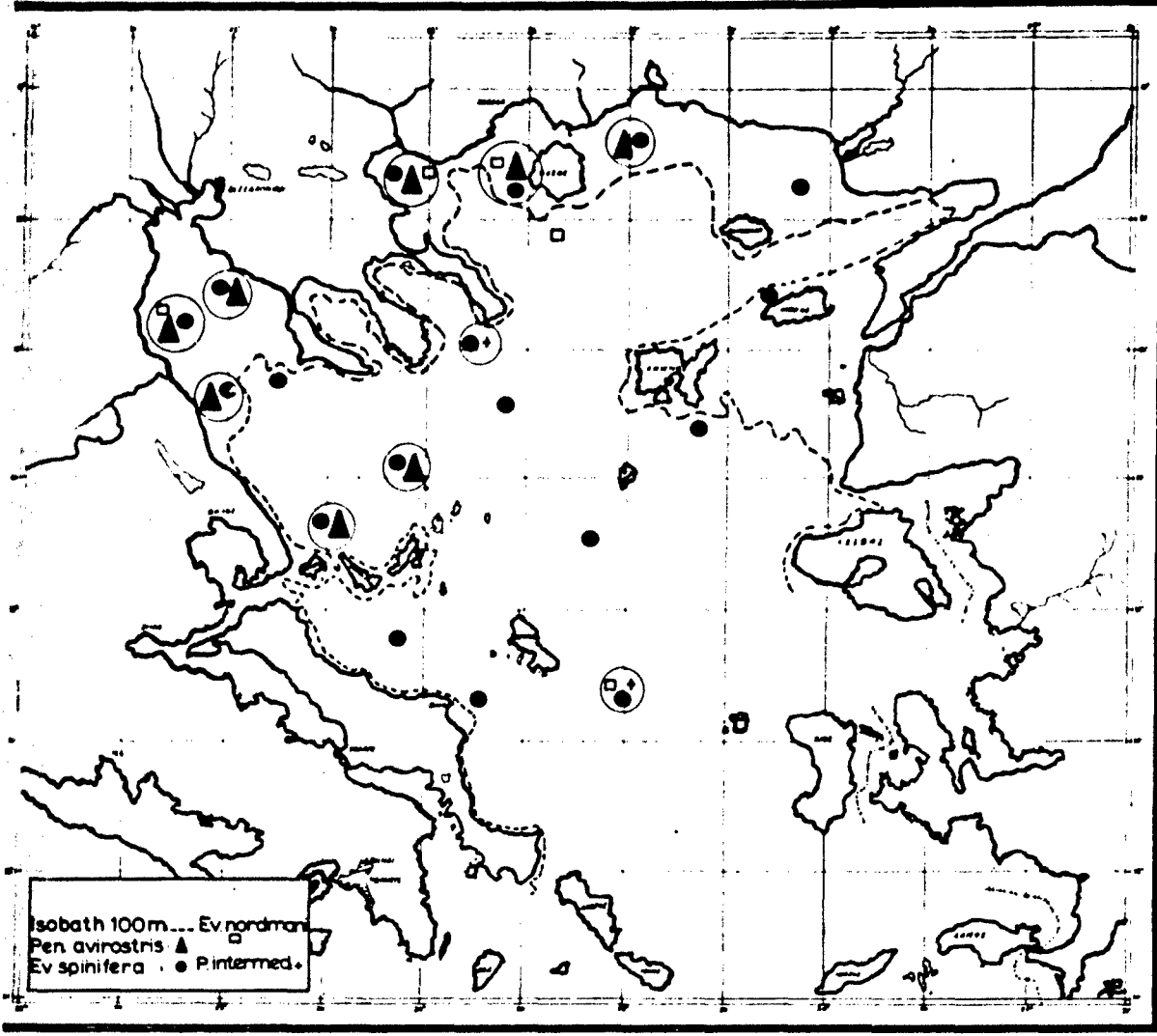
ANNELIDA

Tomopteris sp.
Heteronereis

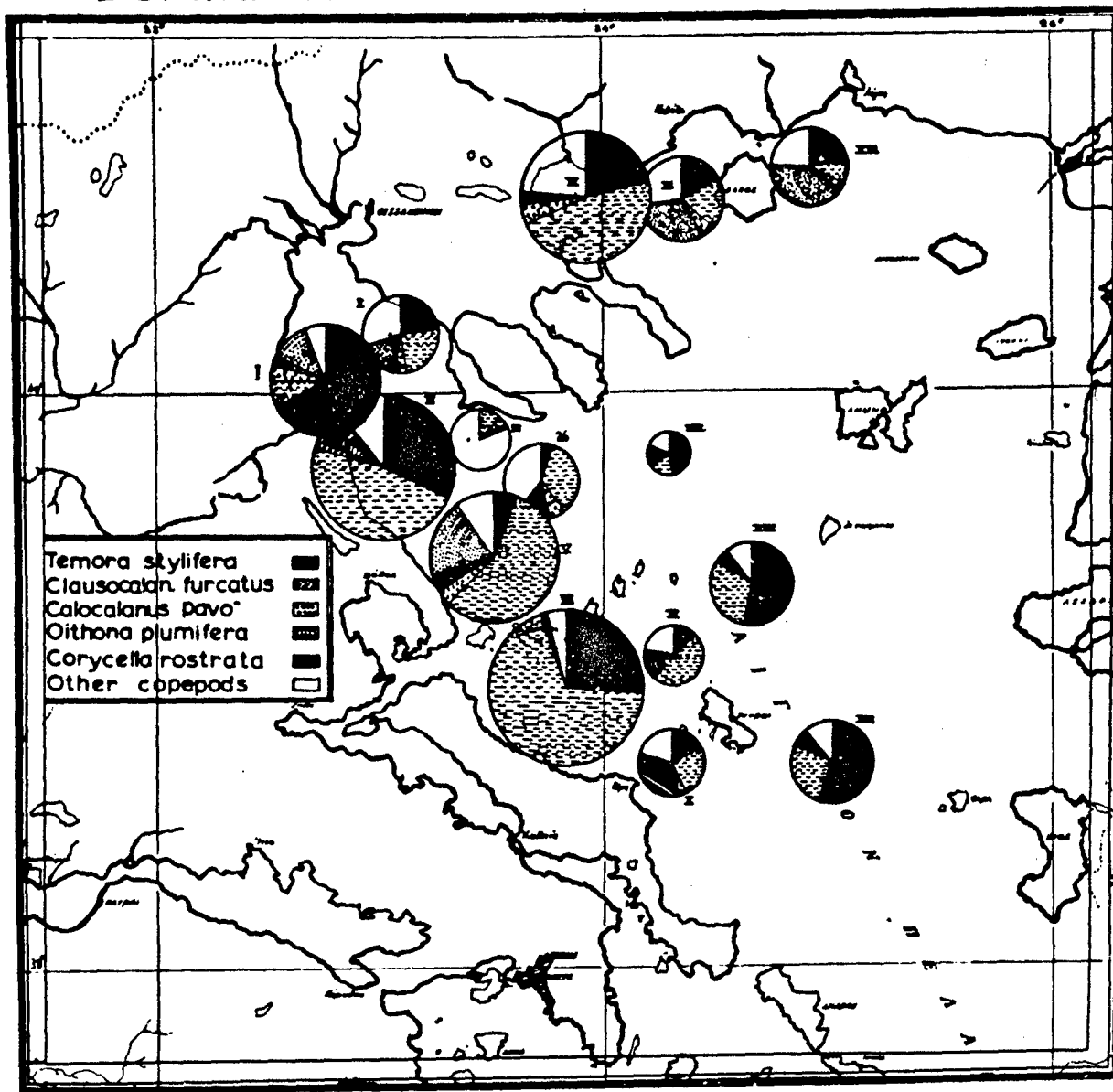
CHAETOGNATHA

Sagitta enflata
S.serratodentata (?)
S.minima

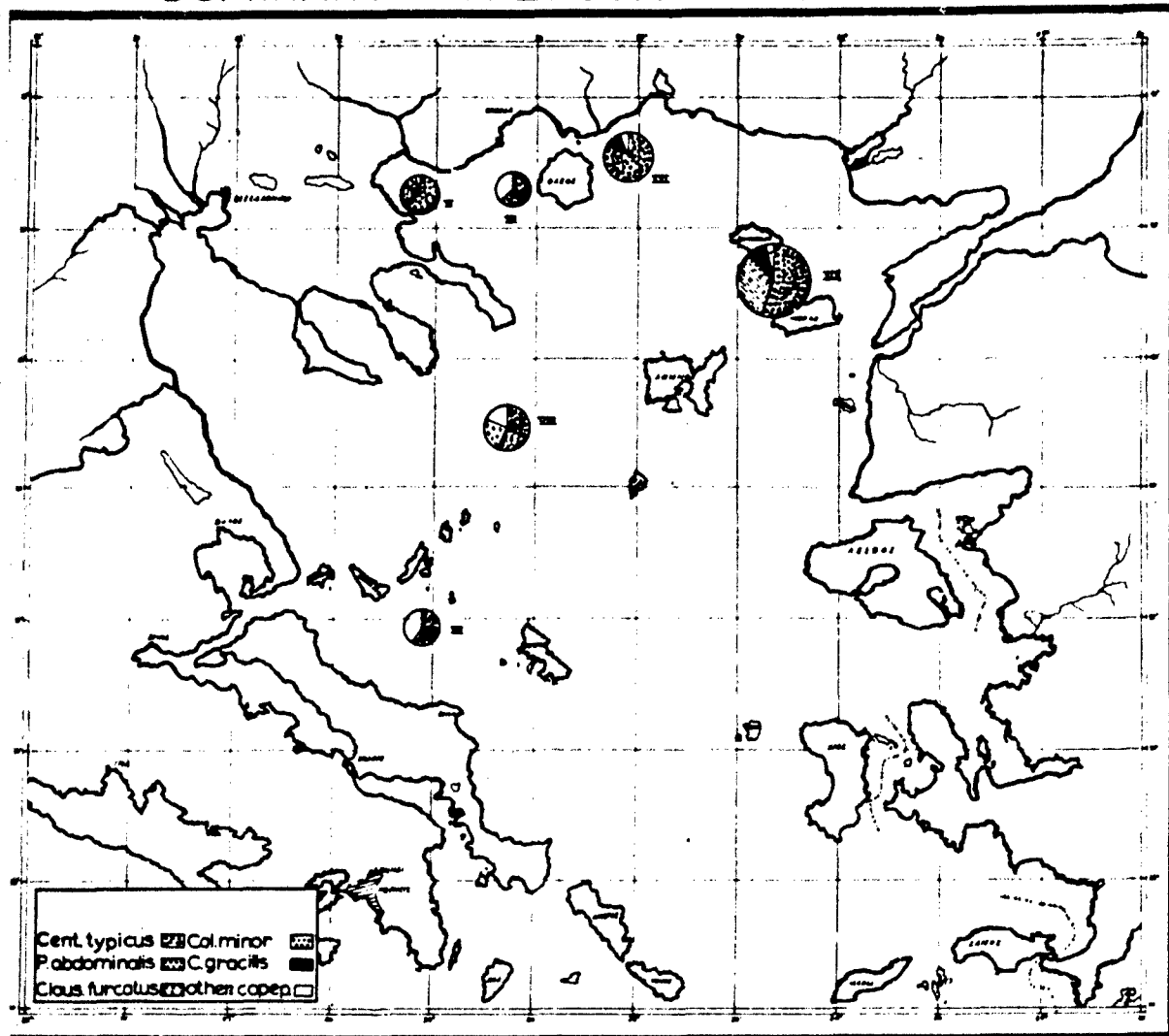
OCURRENCE OF *Penia avirostris* DATA



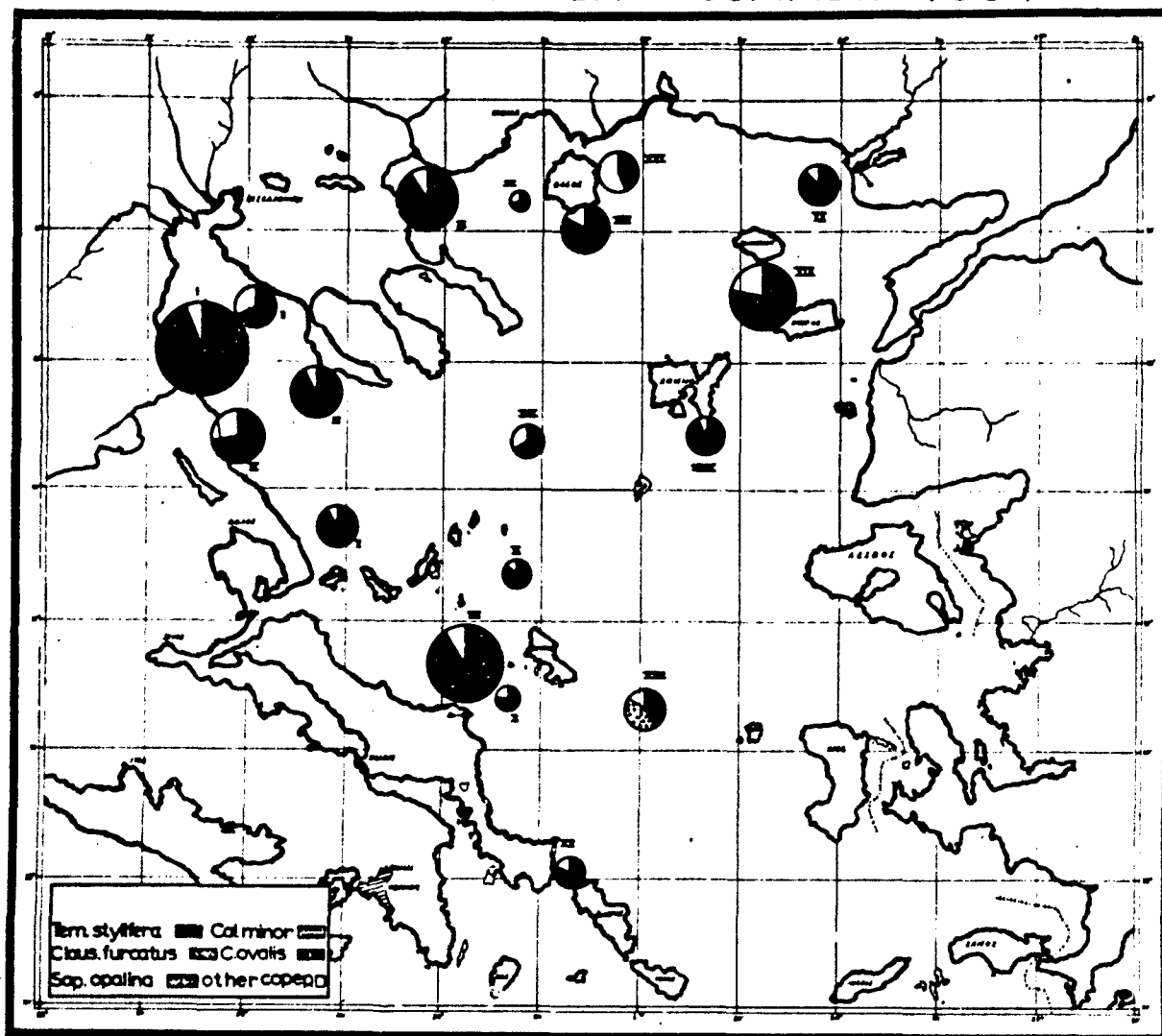
DOMINANT COPEPODA - AUTUMN 1963



DOMINANT COPEPODA - SPRING 1964



DOMINANT COPEPODA - SUMMER 1964



CONCOMITANCE OF *C.aethiopica* AND *C. violaceus*

